

Blade Vibration Measurement System for Characterization of Closely Spaced Modes and Mistuning, Phase I

Completed Technology Project (2008 - 2008)

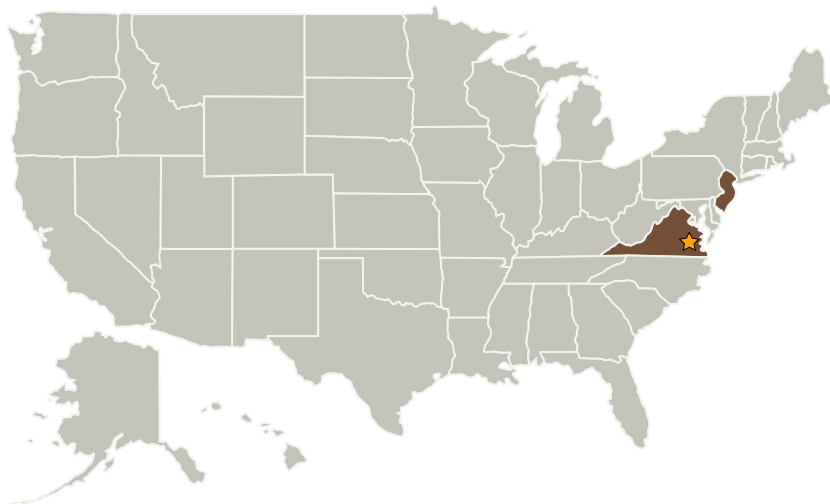


Project Introduction

There are several ongoing challenges in non-contacting blade vibration and stress measurement systems that can address closely spaced modes and blade-to-blade variations (mistuning). Traditional NSMS systems are applicable but have limitations due to the undersampling that is inherent in time-of-arrival data processing and the uncertainty that is introduced by inferring, as opposed to calculating, the mode of vibration. Based on Navy SBIR research, MSI is developing a radar-based blade vibration measurement system with the following capabilities:

- Provides a continuous time series of blade displacement data over a portion of a revolution (solving the undersampling problem).
- Includes data reduction algorithms to directly calculate the blade vibration frequency, modal displacement, and vibratory stress (solving the mode inference problem).
- Uses a single sensor per stage to monitor all of the blades on the stage. The goals for the proposed project are to design and construct an innovative blade vibration measurement system with resolution capable of characterizing mistuning parameters and closely spaced modes of vibration. Development and demonstration of such a system will provide substantially superior capabilities to current blade vibration technology. Phase I demonstration testing will be conducted in MSI's laboratory with an existing instrumented compressor rig.

Primary U.S. Work Locations and Key Partners



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Langley Research Center (LaRC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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| Organizations Performing Work | Role | Type | Location |
|---------------------------------|-------------------------|-------------|----------------------|
| ★ Langley Research Center(LaRC) | Lead Organization | NASA Center | Hampton, Virginia |
| Mechanical Solutions, Inc. | Supporting Organization | Industry | Whippany, New Jersey |

Primary U.S. Work Locations

| | |
|------------|----------|
| New Jersey | Virginia |
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Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Michael Platt

Technology Areas

Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
 - └ TX12.2 Structures
 - └ TX12.2.4 Tests, Tools and Methods